

Japanese Patent Laid-open No. 51-6707

## Specification

### 1. Title of the Invention

Dustproof Mechanism for Magnetic Disk Drive

### 2. Claims

(1) A dustproof mechanism in a magnetic disk drive, characterized by providing a door for a disk storage portion including an opening portion.

(2) The dustproof mechanism according to claim (1), characterized further by making the door open or close by being operatively connected to a brush mechanism.

### 3. Detailed Description of the Invention

The present invention relates to a dustproof mechanism for a magnetic disk drive.

A magnetic disk storage device realizes high density recording by making a magnetic disk spin at high speed and maintaining a slight gap from a magnetic head using an air stream ~~produced as a result of the magnetic disk's spinning~~ motion. If much dust is present around the magnetic disk drive, the dust sneaks into this gap, causing problems of a variety of kinds. In conventional magnetic disk storage

devices of this type, therefore, a high-performance filter has been used to remove dust from air that is then sent to a storage portion of the disk and the magnetic head. The air is then discharged to the outside of the storage portion through another opening provided in the storage portion. It is noted herein that an opening on an inlet side is connected to the filter and thus there is no likelihood that dust will enter from the outside. The other opening, that is, an exit port is, however, left open. While the magnetic disk storage device remains stationary and no air is being blown therethrough, therefore, dust in the outside enters inside through the other opening. A certain type of magnetic disk storage device, on the other hand, has a fixed disk. It is also often the case with the magnetic disk storage device using a removable disk that the disk is not removed and is left loaded in the magnetic disk storage device when the storage device is stationary. There has been, in the conventional magnetic disk storage devices, a drawback that, in cases recited above, the outside dust enters the magnetic disk storage device while the storage device remains stationary, accumulating on a surface of the disk and thus causing a problem.

The present invention has been made to solve the aforementioned drawback in the conventional magnetic disk storage device. It is therefore an object of the present

invention to provide a novel dustproof mechanism, wherein an air exhaust port of a disk storage portion includes a door, the door is operatively connected to a brush mechanism commonly found in these magnetic disk storage devices, and, when the magnetic disk storage device is stationary, the door is closed to block the air exhaust port, thereby preventing entry of dust from the outside, thus preventing problems of various sorts arising from the entry of dust.

A dustproof mechanism according to the present invention includes a disk storage portion, a door disposed so as to open or close the air exhaust port in the disk storage portion, and a drive mechanism connected to the brush mechanism or another mechanism so as to drive the door. The dustproof mechanism can thereby prevent entry of dust into the disk storage portion when air supply is stopped, the entry of dust being a drawback of the dustproof mechanism used in the conventional magnetic disk storage device.

In the present invention, the door disposed in the air exhaust port of the disk storage portion closes the exhaust port while the device is stationary as described above. This arrangement can not only prevent entry of dust into the disk storage portion, but also eliminate a drive power source dedicated to opening and closing the door by making the door operatively connected to the brush mechanism.

Preferred embodiments of the present invention will be described in detail below with reference to the accompanying drawings. Figs. 1 through 3 illustrate a dustproof mechanism of a magnetic disk drive according to a first embodiment of the present invention. Fig. 1 is a plan view schematically showing the first embodiment of the present invention. Fig. 2 is a detailed view showing an area near a brush mechanism shown in Fig. 1. Fig. 3 is a perspective view showing the brush mechanism shown in Fig. 2 as viewed from a brush side. The dustproof mechanism according to the first embodiment of the present invention includes a storage portion 2, a door 4, and a solenoid 5. The storage portion 2 accommodates a disk 1. The door 4 is driven by a brush mechanism 3. The solenoid 5 holds the door 4 in an open position. The brush mechanism 3 includes a shaft 7, a brush 8, and an arm 9. One end of the arm 9 is secured to a shaft 7 that is rotatably journaled on a device board 13. The brush 8 is secured to the other end of the arm 9. A hinge 10 includes the door 4 disposed on one end thereof. The other end of the hinge 10 is rotatably supported on the shaft 7. A spring 6 is provided between the hinge 10 including the door 4 and the device board 13 as shown in Fig. 3. The hinge 10 is configured to return to an original position thereof by the spring 6 at all times. Air that has passed through a filter flows along arrows.

When the magnetic disk drive is started, the shaft 7 rotates counterclockwise, causing the brush 8 to start to clean a disk surface. As the rotation progresses, the arm 9 of the brush 8 presses the hinge 10 against the spring 6 through an engagement between a side surface of the arm 9 and a hinge side surface 10a. This causes the door 4 to start to rotate, which results in an opening portion (an exhaust port) 12 starting to open. As the rotation further progresses, a leading end of the hinge 10 presses an inclined surface of a rod 11 of a solenoid 5 disposed at an appropriate position on the device board 13. Since the solenoid 5 has a spring for return motion built therein, the rod 11 returns to a condition shown in Fig. 2 when the door moves past the rod 11. The brush mechanism rotates through about 90° to complete the cleaning. The brush mechanism thereafter starts rotating backward in a clockwise direction. When the door 4 returns to a position of the rod 11, a lock portion 4a of the door is caught by the rod, bringing the door to a stop at a position indicated by a broken line in Fig. 2. The brush mechanism 3 returns to its original position and stops thereat. Air then passes through the exhaust port 12 and is discharged to the outside. When the magnetic disk drive is stopped, the solenoid 5 is operated to pull the rod 11 thereinto. As a result, the door 4 is returned to a position indicated by a solid line in Fig. 2

by a return force of the spring 6. The exhaust port, that is, the opening portion 12 is hermetically sealed, thus preventing entry of dust from the outside. It is common practice in magnetic disk storage devices to use a DC current as a brake in order to bring the disk to a stop during a shutdown procedure. This current can be used as a driving current for the solenoid.

Figs. 4, 5, and 6 show a dustproof mechanism of a magnetic disk drive according to a second embodiment of the present invention, and are a schematic plan view, a detailed view showing a principal part around a brush mechanism, and a side elevational view of the principal part, respectively. The dustproof mechanism according to the second embodiment of the present invention includes a brush mechanism 15, rollers 16, 17, a wire 18, a door 19, a solenoid 20, and a spring 21. More specifically, a shaft 22 is rotatably journaled on a device board 32. The brush mechanism 15 is secured to the shaft. Further, the roller 16 including a pin 24 disposed on a surface thereof is rotatably supported on the shaft. When the magnetic disk drive is stationary, the spring 17, one end of which is supported by the device board 32, is secured to one end of the door 19 that hermetically seals an exhaust port, that is, an opening portion 33. The wire 18, one end of which is suspended by the roller 16, is supported by the other end of the door 19

via the roller 17. The solenoid 20 is disposed at an appropriate position on the device board 32. According to the second embodiment of the present invention, air flows in from the side of the brush mechanism and is discharged through the other opening portion, that is, the exhaust port 33 as indicated by arrows in Fig. 4 in a direction opposite to that according to the first embodiment of the present invention. When the magnetic disk drive is started, the shaft 22 rotates counterclockwise and, as a result, the brush mechanism 15 is made to operate so that a brush 23 starts to clean the disk surface. As the rotation progresses, an arm 15a of the brush mechanism 15 is engaged with, and presses, the pin 24. As a result, the roller 16 starts to rotate. As described earlier, one end of the wire 18 is secured to the roller 16 and the other end of the wire 18 is connected to the door 19 by way of the roller 17. Moreover, the door 19 is arranged to be slidable along a sidewall of a disk storage portion 14 by a groove (not shown) included in the sidewall. Accordingly, the door 19 moves to the left in the figure via the wire 18 as the roller 16 rotates. When an end portion 25 of the door reaches the position of the solenoid 20, the end portion pushes and moves past a leading end inclined surface of a rod 26 of the solenoid 20. After a backward rotation of the shaft 22 in the clockwise direction following completion of

cleaning, the brush mechanism 15 is returned to its original position with the door held in the position indicated by a broken line in Fig. 5 in the same manner as in the first embodiment of the present invention. The air is thus discharged from the exhaust port 33. During a shutdown procedure, the solenoid 20 is operated and the door 19 is returned by the spring 21 to the position indicated by a solid line in Fig. 5.

The foregoing embodiments of the present invention use the brush mechanism to open or close the door. An embodiment of the present invention in its simplest form is shown in Fig. 7. Referring to Fig. 7, a door 28 is attached via a hinge 29 to a storage portion 27. The door 28 is arranged to be rotatable about the hinge 29. A spring 30 is attached to the hinge 29 so as to hold the door 28 in the position indicated by a solid line in the figure. When a magnetic disk drive is started to start air supply, an air pressure causes the door 28 to open, against the spring 30, to the position as indicated by a broken line in the figure. When the air supply is stopped, the door 28 is returned to the position shown by the solid line by the spring 30. It is obvious that the scope of the present invention includes an embodiment, wherein the same effect is achieved by using, as exemplified by the third embodiment, the air pressure, solenoid, motor, and the like without making the drive of

the door operatively connected to the brush mechanism.

As described in the foregoing, the present invention achieves an effect of reducing accumulation of dust while the magnetic disk drive remains stationary by installing a door at the air exhaust port of the disk storage portion and closing the exhaust port when the magnetic disk drive is stationary. Further, the present invention achieves an effect of providing the aforementioned function at a reasonable cost by making the door operatively connected to the brush mechanism.

While the present invention has been described in conjunction with preferred embodiments thereof, it is evident that these embodiments are only exemplary and many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, it goes without saying that the appended claims are not limited to the aforementioned embodiments.

#### 4. Brief Description of the Drawings

Fig. 1 is a plan view schematically showing a dustproof mechanism of a magnetic disk drive according to a first embodiment of the present invention;

Fig. 2 is an enlarged view showing in greater details an area near a brush mechanism shown in Fig. 1;

Fig. 3 is a perspective view of Fig. 2 as viewed from

a brush side;

Fig. 4 is a schematic plan view showing a second embodiment of the present invention;

Fig. 5 is an enlarged view showing in greater details an area near a brush mechanism and a door shown in Fig. 4;

Fig. 6 is an elevational view of Fig. 5 as viewed from a side; and

Fig. 7 is a schematic plan view showing a third embodiment of the present invention.

1, 31, 34: Disk, 2, 14, 27: Storage portion, 3, 15, 36: Brush mechanism, 4, 19, 28: Door, 5, 20: Solenoid, 6, 21, 30: Spring, 7, 22: Shaft, 8, 23: Brush, 9, 15: Arm, 10, 29: Hinge, 11, 26: Rod, 12, 33, 35: Opening portion (exhaust port), 13, 32: Device board, 16, 17: Roller, 18: Wire, 24: Pin.



特開昭51-6707(2)

塵埃の侵入に基づいて惹起される種々の弊害を阻止するための新規な防塵機構を提供することにある。

本発明はディスク収納部と収納部の空気排出口を開閉できるように設けられた扉と該扉を駆動するようにブラシ機構又は他の機構に連結された駆動機構とから構成される。それによつて、従来の磁気ディスク記憶装置に使用されている防塵機構の欠点であつた送風停止時のディスク収納部への塵埃の侵入を防止することができる。

本発明においては上述の如くディスク収納部の空気排出口に設けられた扉が装置の停止時に排出口を閉じることにより、停止中のディスク収納部への塵埃の侵入を防止するだけでなく、この扉をブラシ機構に連結させることにより、閉閉のための専用の駆動動力源を排除することができる。

次に本発明をその良好な実施例について添付図面を参照しながら具体的に説明する。第1図乃至第3図を参照するに、そこには本発明に係る磁気ディスク装置の防塵機構の第一の実施例が示され

ている。第1図は本発明の第一の実施例の機能的概略平面図、第2図は第1図に示したブラシ機構部付近の詳細図、第3図は第2図をブラシ側から見た斜視図である。本発明の第一の実施例はディスク1を収納する収納部2と、ブラシ機構3により駆動される扉4と、扉4を開放位置に保持するためのソレノイド5とを含む。ブラシ機構3はシャフト7、ブラシ8及びアーム9から構成されている。アーム9は一端に於いて装置基板13に回転自在に軸支された、シャフト7に固定され他端にはブラシ8が固定されている。扉4を一端に設けられたヒンジ10は他端に於いてシャフト7に回転自在に支持されている。扉4が設けられたヒンジ10と装置基板13との間には第3図に示されている如くスプリング6が設けられており、ヒンジ10は該スプリング6によつて常に元位置に復帰する様に構成されている。フィルターを通過した空気は矢印に沿つて流れる。

装置を始動させる際には、シャフト7が反時計方向に回転し、ブラシ8がディスク面の清掃を開

始する。回転が進むとその側面がヒンジの側面10aと係合することによつて、ブラシの端9がスプリング6に抗してヒンジ10を押圧し、従つて扉4も回転を始め開口部(排出口)12は開き始める。回転が更に進むとヒンジ10の先端が装置基板13上の適宜位置に配設されたソレノイド5のロッド11の傾斜面を押す。ソレノイド5には復帰用のスプリングが内蔵されているので、扉が通り過ぎるとロッド11は第2図の状態に復帰する。ブラシ機構は約90°回転すると清掃を終了し、その後は時計方向に反転を開始する。扉4がロッド11の位置まで戻る際には該扉はその係止部4aがロッド11に引掛かることにより第2図の位置で停止する。ブラシ機構3は元の位置に戻つて停止し、空気は排出口12を透つて外部に排出される。装置を停止させるとソレノイド5が作動し、ロッド11がソレノイド5内に引込まれ、その結果扉4はスプリング6の復帰力により第2図の実線の状態に復帰し、排出口即ち開口部12は密閉され、外部からの塵埃の侵入を防止する。磁気ディスク記憶装置では停

止時にディスク板の回転を止めるために、ブレーキに直流電流を使用することが一般的であり、この電流をソレノイドの駆動電流として利用することができる。

第4図、第5図及び第6図は本発明に係る磁気ディスク装置の防塵機構の第二の実施例を示す機能的概略平面図、ブラシ機構部周辺の要部詳細図及び側面図を矢々示すものである。本発明の第二の実施例はブラシ機構15、ローラ16、17、ワイヤ18、扉19、ソレノイド20、スプリング21から構成されている。即ち装置基板32にはシャフト22が回転自在に軸支されており、該シャフトにはブラシ機構15が固定されていると共に、表面にピン24を設けられたローラ16が回転自在に支持されている。装置の静止時には排出口即ち開口部3を密閉している扉19の一端には、一端が装置基板32に支持されたスプリング21が固定され、他端には一端がローラ16に懸架されたワイヤ18がローラ17を介して支持されている。装置基板32上の適宜の位置にはソレノイド20が配設されてい

る。本実施例の場合には第一の実施例とは逆に第4図の矢印のように空気はブラシ機構側から流入し、他の開口部即ち排出口33より排出される。今装置を始動させるとシャフト22が反時計方向に回転し、それに伴ってブラシ機構15が作動せしめられブラシ23がディスク面の清掃を開始する。回転が進むとブラシ機構15の刷15aがピン24と係合し、それを押圧し、それによつて、ローラ16が回転を始める。ローラ16には前述の如くワイヤ18の一端が固定され、他端はローラ17を介して扉19に結合され、しかも扉19はディスク収納部14の側壁に設けられた溝（図示せず）により側壁に沿つてスライド可能なように設けられているので、該扉19はローラ16の回転に伴つてワイヤ18を介して図の左側に移動する。扉の端部25がソレノイド20の位置まで来ると、ソレノイド20のロッド26の先端傾斜面を押して通過するが、清掃終了後に於けるシャフト22の時針方向への反転後は第一の実施例と同様にして扉が第5図の破線の位置に保持されたままブラシ機構15は元の位置に戻り、

減少させる効果がある。また、この扉をブラシ機構に連動させる事により、上記機能を廉価に提供し得る効果がある。

以上本発明はその良好な各実施例に従つて説明されたがそれは単なる例示的なものであり、これら以外にも種々の変形が想起されるものである。従つて以上に示された実施例によつてのみ前記特許請求の範囲が限定されるものでないことは勿論である。

#### 4 図面の簡単な説明

第1図は本発明に係る磁気ディスク装置の防護機構の第一の実施例を示す概略平面図、第2図は第1図に示したブラシ機構部付近を更に詳細に示すための拡大図、第3図は第2図をブラシ側から見た斜視図、第4図は本発明の第二の実施例を示す概略平面図、第5図は第4図に示したブラシ機構部及び扉付近を更に詳細に示すための拡大図、第6図は第5図を側面から見た立面図、第7図は本発明の第三の実施例を示す概略平面図である。

1, 31, 34…ディスク、2, 14, 27…収納部、

特開昭51-6707(3)

空気は排出口33より排出される。停止時にはソレノイド20が作動し、扉19はスプリング21により第5図の実線の位置に復帰させられる。

以上の例はブラシ機構により扉を開閉する場合であるが、本発明の最も簡単な実施例は第7図に示されている。第7図においては扉28はヒンジ29を介して収納部27に取付けられ、ヒンジ29の周囲に回転可能にされている。またヒンジ29の部分にはスプリング30が設けられており、扉28を突線の位置に保持している。装置が始動させられて送風が開始されると、風圧により扉28はスプリング30に抗して破線に示されるように開き、送風が停止すればスプリング30により突線の位置に復帰する。第三の実施例に示したように扉の駆動をブラシ機構に連動させることなく、風圧、ソレノイド、モータ等によつて行う場合も勿論本発明の範囲内に包含されることは明らかである。

本発明は以上説明したように、ディスク収納部の空気排出口に扉を設置し、装置停止時に排出口を閉じることにより、装置停止中の塵埃の堆積を

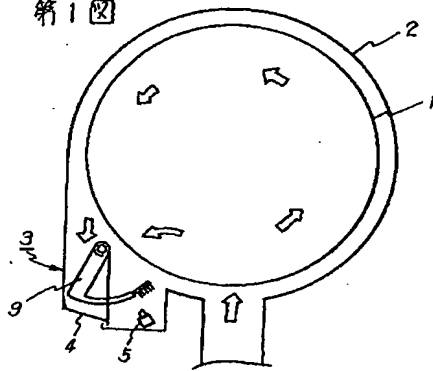
3, 15, 35…ブラシ機構、4, 19, 28…扉、5, 20…ソレノイド、6, 21, 30…スプリング、7, 22…シャフト、8, 23…ブラシ、9, 15…フレーム、10, 29…ヒンジ、11, 26…ロッド、12, 33, 35…開口部（排出口）、13, 32…装置基板、16, 17…ローラ、18…ワイヤ、24…ピン。

特許出願人 日本電気株式会社

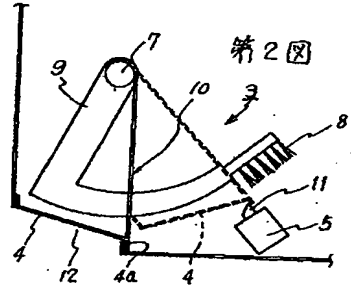
代理人 弁護士 及川昭二

代理人 弁護士 熊谷雄太郎

第1図

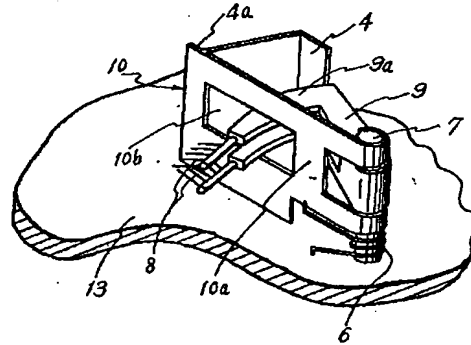


第2図

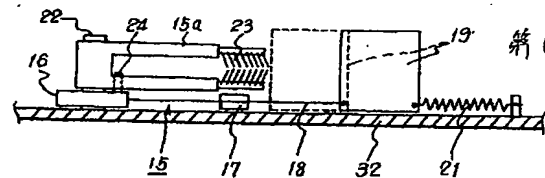


特開昭51-6707 (4)

第3図

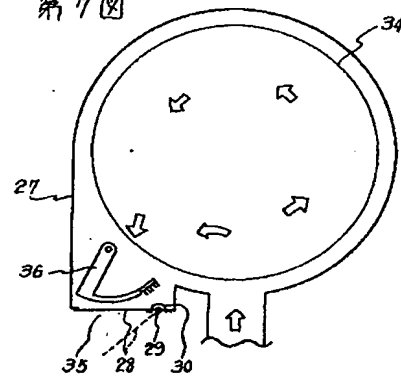


第4図

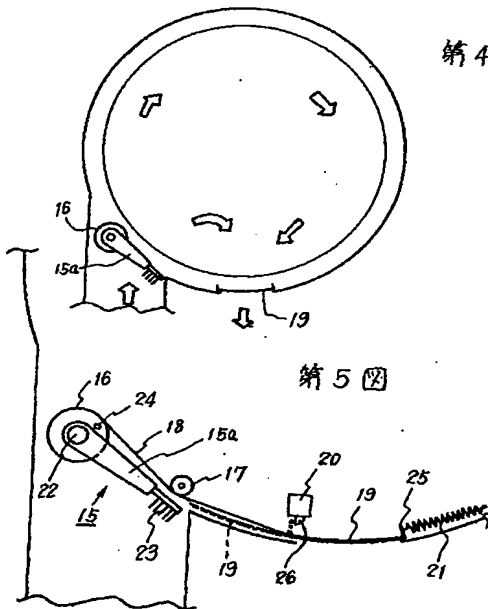


第6図

第7図



第5図



## a 添付書類の目録

特開 昭51-6707(5)

- |     |         |     |
|-----|---------|-----|
| (1) | 明 細 書   | 1 通 |
| (2) | 図 面     | 1 通 |
| (3) | 願 書 副 本 | 1 通 |
| (4) | 委 任 状   | 1 通 |

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